Accreditation Computing Criteria An Evolution

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Abstract

Accreditation Criteria have evolved from the 1930s to the present. Two main trends have driven this evolution. The first is a change from a prescriptive approach to an outcomes based view. The second is a desire on the part of ABET to have the criteria aligned between the four Commissions. This trend has given the programs much more latitude in the way they approach accreditation while the second has made it convenient for institutions that may have multiple programs that are accredited by different Commissions. This paper will inspect how the criteria have changed over time. Attention will be given to the criteria for computing programs in general and specifically information systems

Keywords: accreditation, criteria, ABET, CSAB, CAC

1. Accreditation Background

Computing accreditation can be traced back to the beginning of ABET (ABET, 2009) in 1932 with the establishment of the Engineer's Council for Professional Development (ECPD). The original organizing societies represented civil, mining and metallurgical, mechanical and electrical engineering. The first accreditation began in 1936. Engineering technology programs were added in 1946. By 1951 there were 580 accredited programs in 133 institutions. In 1980 ECPD was renamed Accreditation Board for Engineering and Technology (ABET). The same year applied science programs were added.

In 1985 The Computing Sciences Accreditation Board (CSAB) was established by the ACM and the IEEE - Computer Society (CS) with the responsibility of accrediting programs in computing. At that time the only programs were in computer science. The first information systems (IS) program was accredited in 2001. At about this time the Association for Information Systems (AIS) joined ACM and IEEE-CS as a member society of CSAB.

It was also at about this time (2001) that CSAB merged with ABET. ABET changed its name to ABET inc. so that its broader constituent body which now including applied science, computing, engineering and technology were better represented. Programs in information technology (IT) were added in 2006 bringing us to the present.

ABET now consists of four Commissions each with specific areas of responsibility. The Applied Sciences Accreditation Commission (ASAC) is responsible for applied science programs, the Computing Accreditation Commission (CAC) for all computing programs, Engineering Accreditation Commission (EAC) for all engineering programs and the Technology Accreditation Commission (TAC) for all engineering programs. This has produced some anomalies. For example, software engineering which is considered a subfield of computer science is accredited by EAC.

2. Standards Based Criteria

The first computing criteria were very prescriptive in their formulation. The original information systems criteria were developed under a National Science Grant and were based on those for computer science. The organization of the criteria consisted of a set of criterion, seven for CS and eight for IS. Each criterion consisted of an 'Intent' followed by a set of standards. The 'Intent' statement is a general statement of the criterion in question. Each standard consisted of one or more 'must' statements. For a program to be accreditable all of the 'must' statements had to be satisfied. Let us be a little more specific. The eight IS individual criterion were (ABET 2001):

I. Objectives and Assessments
II. Students
III. Faculty
IV. Curriculum
V. Technology Infrastructure
VI. Institutional Support and Financial Resources
VII. Program Delivery
VIII. Institutional Facilities

As an example we will look at just one part of number IV, the Curriculum criterion. This criterion was divided into five areas with a total of 16 standards. Below are the Intent and the information systems part of the curriculum criterion.

Intent
The curriculum combines professional requirements with general education requirements and electives to prepare students for a professional career in the information systems field, for further study in information systems, and for functioning in modern society. The professional requirements include coverage of basic and advanced topics in information systems as well as an emphasis on an IS environment. Curricula are consistent with widely recognized models and standards (ABET 2001).

Curriculum Criterion: Information systems section
IV-5. All students **must** take a broad-based core of fundamental information systems material consisting of at least 12 semester hours.
IV-6. The core materials **must** provide basic coverage of the hardware and software, a modern programming language, data management, networking and telecommunications, analysis and design, and role of IS in organizations.
IV-7. Theoretical foundations, analysis, and design **must** be stressed throughout the program.
IV-8. Students **must** be exposed to a variety of information and computing systems and must become proficient in one modern programming language.
IV-9. All students **must** take at least 12 semester hours of advanced course work in information systems that provides breadth and builds on the IS core to provide depth.

As noted each statement contains a 'must' statement. This proved very restrictive and prevented many programs from developing creative new ways to teach the subject matter.

3. Outcomes based assessment.

Toward the end of the 1990s the EAC started to develop plans on moving toward an outcomes based approach to accreditation stressing continuous improvement. Programs could now define their own program objectives and student learning outcomes. It was thought that this would give programs more latitude in delivering their programs. EAC launched Engineering Criteria 2000 (EC2000) in the year 2000. CAC followed several years later and is now in the final stages of implementation. In fact all programs seeking accreditation for the first time or reaccreditation must now use the outcomes based criteria.

Another driving force by the members of ABET was to make the accreditation process as easy as possible for institutions. Until recently all four Commissions used criteria that used different wording and were presented in different order. A three year effort is in the final stages to align the criteria across Commissions.

Each Commission now has the identical number of nine criteria presented in the same order. Where ever possible the criteria for the different Commissions uses identical wording. The nine criteria are

Students, Program Educational Objectives, Program Outcomes, Continuous Improvement, Curriculum, Faculty, Facilities, Support and Program Criteria. Within each Commission the Criteria that have been aligned across Commissions are Students, Program Educational Objectives, Continuous Improvement, Facilities and Institutional.

Within each Commission the first eight criteria are identical for all programs. They are known as the General Criteria. Thus information systems, information technology and computer science have the identical set of eight criteria. The Program Criteria are used to differentiate between areas within each Commission. There is also agreement in ABET that only the Program Outcomes, Curriculum and Faculty may be appended. It is prohibited for an individual program area to change anything within the General Criteria. It is now possible for a program that would naturally fall under the auspices of a particular Commission, but for whom there is no Program Criteria, to be evaluated by just the General Criteria. An example of this is programs in computational science.

Example 1.
In the old Criterion the entire assessment area is addressed by a single criterion (ABET 2001).

I. Objectives and Assessments
Intent
The program has documented, measurable objectives, including expected outcomes for graduates. The program regularly assesses its progress against its objectives and uses the results of the assessments to identify program improvements and to modify the program's objectives.
Standards
I-1. The program must have documented, measurable objectives.
I-2. The program's objectives must include expected outcomes for graduating students.
I-3. Data relative to the objectives must be routinely collected and documented, and used in
program assessments.
I-4. The extent to which each program objective is being met must be periodically assessed.
I-5. The results of the program's periodic assessments must be used to help identify opportunities for program improvement.
I-6. The results of the program's assessments and. he actions taken based on the results must be documented.

This wording is quite precise and leaves little room for program creativity. To emphasize the importance of continuous improvement and to clarify the expectations for the program seeking accreditation the outcomes based criteria split this area into three separate criterion; Program Educational Objectives, Student Outcomes and Continuous Improvement. We include the Program Educational Objectives and Continuous Improvement here. The Program Outcomes are discussed in the next section.
Criterion 2. Program Educational Objectives
The program must have published program educational objectives that are consistent with the mission of the institution, the needs of the program's various constituencies, and these criteria. There must be a documented and effective process, involving program constituencies, for the periodic review and revision of these program educational objectives.
Criterion 4. Continuous Improvement
The program must regularly use appropriate, documented processes for evaluating the extent to which both the program educational objectives and the student outcomes are being attained. The results of these evaluations must be utilized as input for the continuous improvement of the program.

This change now leaves the individual programs the flexibility to define their own program educational objectives and the methods used to demonstrate continuous improvement. This leaves considerable flexibility in meeting the requirements.

Example 2
We will look at two of the CAC criteria that also have program specific additions. The first is Program Outcomes. Program outcomes describe what students are expected to know and be able to do by the time of graduation.
Criterion 3. Program Outcomes (ABET 2009)
The program has documented, measurable outcomes that are based on the needs of the program's constituencies. The program enables students to achieve, by the time of graduation:

(a) An ability to apply knowledge of computing and mathematics appropriate to the discipline
(b) An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution
(c) An ability to design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs
(d) An ability to function effectively on teams to accomplish a common goal
(e) An understanding of professional, ethical, legal, security and social issues and responsibilities
(f) An ability to communicate effectively with a range of audiences
(g) An ability to analyze the local and global impact of computing on individuals, organizations, and society
(h) Recognition of the need for and an ability to engage in continuing professional development
(i) An ability to use current techniques, skills, and tools necessary for computing practice.

Information systems adds the following:

(j) An understanding of processes that support the delivery and management of information systems within a specific application environment.

Computer Science adds:

(j) An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.
(k) An ability to apply design and development principles in the construction of software systems of varying complexity.

The second criterion that has differences in the program criteria is Faculty. The General Criteria are:

Criterion 6. Faculty
A. Faculty Qualifications
Faculty members teaching in the program are current and active in the associated computing discipline. They each have the educational backgrounds or expertise consistent with their expected contributions to the program. Each has a level of competence that normally would be obtained through graduate work in the discipline, relevant experience, or relevant scholarship. Collectively, they have the technical breadth and depth necessary to support the program.
B. Faculty Size and Workload
There are enough full-time faculty members to provide continuity, oversight, and stability, to cover the curriculum reasonably, and to allow an appropriate mix of teaching, professional development, scholarly activities, and service for each faculty member. The faculty assigned to the program has appropriate authority for the creation, delivery, evaluation, and modification of the program, and the responsibility for the consistency and quality of its courses.

Information Systems adds:

Some full-time faculty, including those responsible for the IS curriculum development, hold a terminal degree in information systems.

Computer Science adds:

Some full time faculty members have a Ph.D. in computer science.

As you can see the criteria for CS and IS have very similar requirements for faculty member qualifications.

4. Conclusion

The path leading to the current state of accreditation has taken almost 80 years. The efforts of thousands of professionals have been involved in the development of the criteria and procedures for accreditation. These efforts have always had the goal of improving the education of individuals so that they may make positive contributions to society. The current criteria make it easier for institutions which have different programs being evaluated by more than one Commission. These criteria also permit programs to more easily adapt their programs to meet the needs of their specific constituents.

5. References

ABET(2009), http://www.abet.org/history.shtml. Retrieved on 24 August 2009.

ABET(2009), http://www.abet.org/Linked%20Documents-UPDATE/Criteria%20and%20PP/C001%2008-09%20CAC%20Criteria%2011-8-07.pdf. Retrieved on 13 October 2009.

ABET (2001), these criterion were published http://www.abet.org in 2001 but are no longer available on the web. A copy may be obtained directly from ABET. Retrieved on 23 August 2009.